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Acoustic Spectral Analysis and Testing Techniques

Four reports have been published (see references) that outline some recent developments in acoustic spectral analysis. The subjects covered are described below.

The *Octave and One-Third Octave Acoustic Noise Spectrum Analysis* discusses mathematical techniques for combining decibel levels of octaves or constant bandwidths with an overall spectrum level; determining the octave levels in a second octave system when the levels in the first octave are known; and determining the one-third octave levels when the octave levels and the decibels-per-octave slope are known.

In *Power Spectral Density Analysis*, generalized techniques are developed for determining the equation for a power spectral density function. Moreover, an equation is developed that determines the root mean square of a power spectral density function.

The report on *A Digital Technique For Determining 1/3 - Octave Sound-Pressure Levels With a More Uniform Confidence Level* describes a computer program that analyzes acoustical test data. The program uses a fast Fourier subroutine to calculate the discrete Fourier coefficients that transform the time-domain data to frequency-domain data. Multiple Fourier transforms are used to convert the narrow-band frequency data to 1/3-octave data.

In the *Acoustic Spectrum Shaping Utilizing Finite Hyperbolic Horn Theory*, sound spectra of high-intensity sound are shaped for single horns and multiple-horn arrays. This technique utilizes computer simulation of horn responses by use of the hyperbolic horn theory.

References:

C. D. Hayes and M. D. Lamers, Technical Report 32-1052, Octave and One-Third Octave Acoustic Noise Spectrum Analysis.

C. D. Hayes, Technical Report 32-928, Revision 1, Power Spectral Density Analysis.

J. W. Shipley and R. A. Slusser, Technical Memorandum 33-422, A Digital Technique for Determining 1/3-Octave Sound-Pressure Levels With a More Uniform Confidence Level.

C. D. Hayes, Technical Report 32-1141, Acoustic Spectrum Shaping Utilizing Finite Hyperbolic Horn Theory.

Note:

Requests for this documentation and other information may be addressed to:

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Reference: B72-10341

Patent status:

No patent action is contemplated by NASA.

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NASA Pasadena Office
(NPO-11554)

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